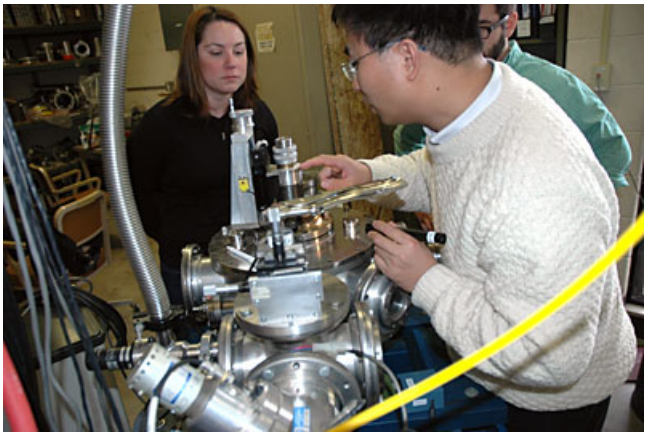

INL's Heather MacLean (left) and the University of Wisconsin's Guoping Cao and Tyler Gerczak collaborate on a National Scientific User Facility nuclear research project at UW's Ion Beam facility.

# First university experiments removed from INL's Advanced Test Reactor to undergo post-irradiation analysis

By Stacey Francis, for *INL Communications & Governmental Affairs*

After a year of intense nuclear irradiation, the first four university experiments to use Idaho National Laboratory's Advanced Test Reactor (ATR) National Scientific User Facility are coming out of the reactor. Up next for the experiments: post-irradiation analysis, another key step in the User Facility's effort to encourage collaboration among nuclear energy researchers from academia, industry and U.S. Department of Energy national labs.

The User Facility program, established by DOE in 2007, grants university-led scientific groups access to the ATR — one of the world's most versatile research reactors — and other resources at INL and affiliated institutions. The four experiments coming out of the ATR are led by North Carolina State University, the University of Florida, the University of California at Santa Barbara and the University of Illinois. They were the first four projects selected by the User Facility in January 2008.

***The University of Illinois project includes research on "subsize tensile holders" such as those pictured above.***

Todd Allen, scientific director for the User Facility, says the arrangement to share research capabilities is valuable to both INL and academia.

"The benefit of a National User Facility is tremendous," Allen said. "Instead of limiting access to resources and capabilities, the User Facility provides an opportunity for the best ideas to be brought forth and tested. It creates a way to prove the principles that otherwise would have been just another good idea that couldn't be tested for lack of resources."

Chief among these resources is the ATR, which can accommodate multiple experiments simultaneously; its design allows operators to subject different projects to vastly different conditions. Further, the ATR can generate extremely high neutron levels, allowing researchers to gauge in mere months how a test material might hold up after many years inside a commercial nuclear reactor. The User Facility also includes INL's Materials and Fuels Complex, where researchers will perform vital post-irradiation examinations.

The User Facility also offers access to the capabilities of a growing number of partner facilities, such as North Carolina State University's PULSTAR research reactor.

"The ATR NSUF has developed a sort of multifaceted approach to solving the questions about nuclear fuels and materials," Allen said. "These collaborations that are being built through partners and proposers are continually expanding."

Not only does the User Facility provide a tremendous opportunity for advancing nuclear research across the nation, it also provides an exceptional teaching and learning environment.

***INL's Pavel Medvedev and the University***

Graduate students, undergrads, senior researchers and professors propose and participate in the experiments. They work with an INL principal investigator, who helps out with experimental design and post-irradiation testing. The program provides a rare opportunity for those interested in nuclear research to engage at all levels in the process, from formulating the idea to designing the experiment to analyzing the resulting data.

"This program is exciting because it allows students at the start of their careers or studies to see first-hand the fabrication, assembly and data collection processes," said Gregg Wachs, an INL radiation test engineer working on User Facility projects. "It is providing hands-on experience for our next generation of nuclear researchers."

***of Florida's Donald Moore prepare samples for the UF experiment capsule.***

Wachs sees tremendous benefits coming from User Facility collaborations.

"We are building an infrastructure for a campus-like environment that goes beyond basic research," he said. "We are building a gathering place for information and integrating the needs across academia and industry to further our understanding. It is a unique environment that could have a huge impact across the industry."

The four projects about to begin post-irradiation examination, and their principal investigators, are:

- Dr. K.L. Murty of North Carolina State University is studying irradiation behavior of nanostructured metals and alloys. INL experiment support: Dr. Douglas Porter.
- Dr. Juan Nino of the University of Florida is investigating inert matrix ceramic fuel for destruction of plutonium and minor actinides. INL experiment support: Dr. Pavel Medvedev.
- Dr. Robert Odette of the University of California, Santa Barbara will create a "library" of neutron-irradiated materials to be used in the characterization of irradiated advanced structural alloys. INL experiment support: Dr. James Cole.
- Dr James Stubbins of the University of Illinois will investigate the irradiation behavior of iron-chromium alloys. INL experiment support: Dr. Jian Gan.

All told, 10 universities are leading 12 experiments at the User Facility. The other institutions are the Colorado School of Mines, Drexel University, Idaho State University, Massachusetts Institute of Technology, the University of Wisconsin-Madison and Utah State University.

Access to the User Facility is awarded through a bi-annual competitive solicitation process. Awards are based on scientific merit and relevance to DOE-Nuclear Energy missions. The next closing date for applications is April 1, with the following one in October 2010.

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